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AUTHOR Bailey, Thomas; Gribovskaya, Alexandra
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ABSTRACT

Education reform in the 1980s and 1990s emerged from a preoccupation with productivity and economic performance. In the 1980s, the country's education system was blamed for slowing productivity growth and weakening international competitiveness. By the end of the 1990s, the economic context had changed dramatically; unemployment rates were at historical lows, stock prices remained high, and impressive developments associated with computers and the Internet seemed only to scratch the surface of the potential in that sector. Still, in education, the United States is implementing a reform agenda that was developed in one economic context and, according to its advocates, was designed to solve a particular set of economic problems. The changing international comparisons during this period have a negative influence on those aspects of the education reform agenda that were most closely tied to employers and the workplace--employer participation, work-based learning, and systems of specifically focused skill standards. There is little evidence to evaluate the relationship between education and economic performance after 20 years of education reform explicitly designed to improve that performance. Although research suggests that more education improves national economic growth and increases economic performance, exactly which skills are most important and how they should be taught is not apparent. New research should be aimed at specific workplaces and classrooms and at the determinants of individual career progression in order to develop an understanding of the education and skill needs of the economy. (Contains 47 references.) (KC)

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National Center for Research in Vocational Education

University of California, Berkeley

Reassessing a Decade of Reform

Workforce Development and the Changing Economy

Thomas Bailey
Alexandra Gribovskaya
Teachers College
Columbia University

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National Center for Research in Vocational Education
University of California, Berkeley
2030 Addison Street, Suite 500
Berkeley, CA 94720-1674

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Executive Summary

Education reform in the 1980s and 1990s emerged from a preoccupation with productivity and economic performance. In the 1980s, the country's education system was blamed for slowing productivity growth and weakening international competitiveness. By the end of the 1990s, the economic context has changed dramatically; unemployment rates are at historical lows, stock prices remain high, and impressive developments associated with computers and the Internet seem only to scratch the surface of the potential in that sector. Still, in education, we are implementing a reform agenda that was developed in one economic context and, according to its advocates, was designed to solve a particular set of economic problems. Thus, we want to ask whether an education reform agenda motivated to a large extent by a particular economic context is still appropriate now that that context appears to have changed.

In the first part of this report, we review the arguments advanced during the 1980s and early 1990s concerning the relationship between education and the economy and describe the education reform agenda that followed those arguments. We then review evidence about the economy and related education reforms that were developed during the 1990s. Based on this new evidence and experience, we then reassess the current education reform agenda, suggesting future policy and research directions.

Workforce Development Reform Agenda of the 1980s

The national preoccupation with the weakening international competitive position of the American economy led to extensive discussion of workforce development. The emerging literature was united by a sense of urgency and crisis. A number of reports, including *A Nation at Risk* and *America's Choice: High Skills or Low Wages!*, claimed that profound weaknesses in the education system were undermining U.S. productivity and competitiveness. The emerging consensus was that in order to be more competitive, U.S. workers needed more education and more advanced and different skills. In addition to international comparisons, dramatic changes in the relative earnings of high school and college graduates, growth in occupations requiring higher levels of education, and the changing nature of work organization suggested that skill requirements were changing.

According to the typical arguments of the era, other countries seemed to do a much better job of preparing their workforces. Based on a favorable impression of European and Asian education systems and an understanding of the changing nature of work, a national workforce development reform agenda emerged. It included the following seven points:

1. Skill requirements of work were rising, suggesting that workers at all levels of the employment hierarchy needed stronger academic skills.
2. The education system needed to do a better job of teaching a set of skills, such as problem solving and teamwork, that were neither traditional academic nor vocational skills. The Secretary's Commission on Achieving Necessary Skills (SCANS) developed a list of such skills in 1991.
3. Education systems needed to shift from a focus on regulating the educational process to measuring and demanding standards for educational outcomes.
4. Education could be improved through the use of innovative pedagogies such as integrated academic and vocational instruction and work-based learning.
5. Employers needed to be much more involved with the education system through stronger advisory roles and the provision of work-based learning opportunities.
6. Students needed to have better information on the requirements for particular occupations, and, indeed, pathways to occupations needed to be made more systematic through improvements in the use of skill standards.
7. The transition from high school to postsecondary education needed to be strengthened, especially for students who had traditionally not continued their education after high school.

These principles were operationalized in a series of federal laws, which included the 1990 and 1998 reauthorizations of the Perkins Act, the School-to-Work Opportunities Act (STWOA), the Goals 2000: Educate America Act, and the Workforce Investment Act. The STWOA was probably the most comprehensive attempt to implement this broad workforce development strategy.

Reassessing the Workforce Development Reform Agenda

While policymakers and educators were trying to restore prosperity by reforming the education system, the U.S. economic system entered a period of unprecedented growth and low unemployment; however, improvements in the education system are unlikely to account for this apparent turnaround. These reforms remain at the margins of the U.S. education system, and there have been very moderate, if any, improvements in student performance as measured by test scores. Thus, education reform cannot claim credit for positive U.S. economic performance in the 1990s.

Yet, calls for education reform were not based only on the comparative performance of the U.S. economy. The 1980s conception of workplace skill needs that formed the basis of the current workforce development reform agenda has been confirmed by research during the 1990s. College graduates

still receive a substantial premium in the labor market; jobs are shifting steadily towards occupations with more highly educated incumbents; and there is some evidence that academic and SCANS skills are increasingly important. This suggests that basing policy on those developments is probably still appropriate, despite the changes in the strength of the U.S. economy relative to its competitors.

Much of the workforce development reform agenda that was developed in the 1980s and early 1990s remains intact. The changed economic environment and international comparisons have not significantly affected the part of the reform agenda which focuses on the importance of academic and SCANS skills and educational outcomes and accountability. The changing international comparisons, however, have had a negative influence on those aspects of the agenda that were most closely tied to employers and the workplace—employer participation, work-based learning, and systems of specifically focused skill standards. As the comparative arguments lose force, we will probably see continued strengthening of the high school and college focus but with an additional emphasis on testing academic skills. SCANS skills could play a role if educators could figure out how to measure and assess them. The effect of all this is that traditional high school vocational education is fading and will continue to do so.

What is perhaps most surprising is how little we know about the relationship between education and economic performance after twenty years of education reform explicitly designed to improve that performance. Although evidence suggests that more education improves national economic growth and productivity and increases individual earnings, little is known about exactly which skills are most important and how they should be taught. International comparisons, which are useful for generating ideas about alternative policies and strategies, are often misleading, especially when only a handful of countries are being compared. Many factors other than education influence macroeconomic performance, and in any case, any educational policy could only be expected to have an effect after many years. We need to focus at a more microeconomic level, at specific workplaces and classrooms, and at the determinants of individual career progression if we want a more concrete and specific understanding of the education and skill needs of the economy.

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Introduction

Educational reform in the 1980s and 1990s was motivated by economic anxiety. The country's education system was blamed for slowing productivity growth and weakening international competitiveness. Economic discussions in the 1980s were dominated by images of corporate restructuring, rust-belt plant closings, and the apparently unstoppable Japanese and German manufacturing juggernauts. The country's international position had a profound influence on education policy during the 1990s as educators tried to introduce strategies that they believed were responsible for the economic strength of Japan and parts of Europe.

At the end of the decade, however, the economic context that gave rise to the education reform agenda appears to have changed dramatically. In 1999, unemployment rates are at historical lows, stock prices remain high, and the impressive developments associated with computers and the Internet seem only to scratch the surface of the potential in that sector. Thus, by the end of the 1990s, the educational study tours had reversed direction. Countries that hosted delegations of American educators and policymakers during the 1980s and early 1990s began to send their own groups to try to understand the educational basis of American economic success. Reformers talked less about the benefits of European-style apprenticeships and more about the advantages of the diverse and flexible U.S. postsecondary education sector.

This report looks back at the education reform agenda that emerged from this preoccupation with productivity and economic performance. The beginning of a new century provides a convenient opportunity to reevaluate the reforms of the last decade. Education reform takes time. We are now implementing a reform agenda that was developed in one economic context and, according to its advocates was designed to solve a particular set of economic problems. Thus, we want to ask whether an education reform agenda motivated to a large extent by a particular economic context is still appropriate now that that context appears to have changed. Looking back, how would we reevaluate our own reform agenda, one that owed much to examples from Europe and Asia, now that educators are more skeptical about the effectiveness of these systems?

We first review the arguments advanced during the 1980s and early 1990s about the relationship between education and the economy and describe the education reform agenda that followed those arguments. We then review evidence about the economy and about related education reforms that were developed during the 1990s. Based on this new evidence and experience, we then reassess the current education reform agenda, suggesting future policy and research directions.

Education and the Economy in the 1980s

The early 1980s were a watershed in education reform. Earlier preoccupation about access and equity gave way to anxiety about the relationship between education and national economic performance. The combination of recession and inflation that characterized the 1970s had already damaged the economic optimism of the post-World War II decades. By the early 1980s, growing trade deficits linked with manufacturing layoffs and plant closings undermined the sense of U.S. economic ascendancy. The national preoccupation with the weakening international competitive position of the American economy led to an extensive discussion of workforce development. The emerging literature was united by a sense of urgency and crisis.

Two of the best examples of the alarmist reports of the period are *A Nation at Risk* (National Commission on Excellence in Education, 1983) and *America's Choice: High Skills or Low Wages!* (Commission on the Skills of the American Workforce, 1990). The former claimed that profound weaknesses in the education system were undermining U.S. productivity and competitiveness. The authors of *America's Choice: High Skills or Low Wages!* concluded that in the U.S.,

> typical high school graduates mill about in the labor market, moving from one dead-end job to another until the age of 23 or 24. Then with little more in the way of skills than they had at 18, they move into the regular labor market, no match for the highly trained German, Swedish, and Danish youth of 19. (p. 46)

These and other publications argued that without fundamental education reform, the U.S. would increasingly fall behind the economic position of its major competitors.

At the same time, economists and sociologists were reexamining the nature of work and the skills that were required to be an effective worker. In 1989, Bailey argued that the intensification of international competition, the rapid pace of technological change, and the diversification of product markets had changed the nature of work. The U.S. had risen to economic prominence on the basis of a mass production system that minimized the unit costs of the production of immense quantities of standardized goods. Since markets and technologies were relatively stable, engineers had time to design simple production systems with minimal skill requirements; however, as consumers began to demand more variety and as computerized technology began to change more rapidly, workers found themselves in an

environment that was unstable and ill-defined. Workers had to be able to respond to problems and changes that arose more frequently than in the traditional workplace, and they had to have a deeper understanding of their responsibilities and work more effectively and interactively with their coworkers (Bailey, 1989). Many other analysts came to similar conclusions (Carnevale, Gainer, & Melzer, 1988; Committee on Science, Engineering, and Public Policy, 1984; Dertouzos, Lester, & Solow, 1989; National Center on Education and the Economy, 1990; Piore & Sabel, 1984; U.S. Departments of Education and Labor, 1988; U.S. Department of Labor, 1989, 1991). According to these arguments, in order to be more competitive, U.S. workers needed more education and more advanced and different skills.

Conclusions reached during the 1980s about changing skill requirements were based on three types of information: (1) dramatic changes in the relative earnings of high school and college graduates suggested that employers increasingly valued the skills held by those with higher levels of education (Murphy & Welch, 1989); (2) the occupations in which the incumbents had higher levels of education tended to be the occupations that were projected to grow most quickly, although this trend was modest (Johnston & Packer, 1987); and (3) many case studies of work tended to find evidence that skill requirements were rising, although this was most pronounced for firms that used the high-performance work organization. Firms that chose a more traditional work organization required fewer skills (Bailey, 1989).

According to typical arguments of the era, the U.S. education system had effectively prepared students to work in a mass production environment. The system trained an adequate number of managers, professionals, and engineers who could design and manage the production systems. The majority of workers needed not only rudimentary academic skills, but also a certain amount of discipline and the ability to carry out instructions. The American high school seemed to be able to adequately teach these types of skills and behaviors.

In the 1980s, however, as a result of the changing nature of work, this no longer was adequate. Moreover, other countries, in particular Germany and Japan, seemed to do a much better job of preparing their workforce to work in modern high-performance firms. American managers and professionals measured up to their foreign counterparts, but so-called "front-line" workers—those who actually carried out the production and service delivery tasks—apparently received a much less effective education in the U.S. than in these other countries.

Because of the apparent success of these foreign models, U.S. policymakers and educators flocked to Europe and Japan to try to learn lessons from their education systems. This influence is particularly clear in the 1990 publication of *America's Choice: High Skills or Low Wages!* by the Commission on the Skills of the American Workforce. That report virtually

set out a blueprint for the education agenda of the first Clinton Administration, and, indeed, members of that commission filled many of the most important education-related jobs in the Clinton Administration, including the Secretaries of Education and Labor. Furthermore, the outlines of the German apprenticeship system can easily be discerned in the 1994 School-to-Work Opportunities Act (STWOA) and in parts of the Goals 2000: Educate America Act (passed in 1994) which were built on European systems of industry and occupational certification.

The workforce development reform agenda that emerged from this understanding of the changing nature of work and the favorable impression of European and Asian education systems included the following seven points:

1. Skill requirements of work were rising, suggesting that workers at all levels of the employment hierarchy needed stronger academic skills.
2. The education system needed to do a better job of teaching a set of skills, such as problem solving and teamwork, that were neither traditional academic nor vocational skills. The Secretary's Commission on Achieving Necessary Skills (SCANS) developed a list of such skills in 1991.
3. Education systems needed to shift from a focus on regulating the educational process to measuring and demanding standards for educational outcomes.
4. Education could be improved through the use of innovative pedagogies such as integrated academic and vocational instruction and work-based learning.
5. Employers needed to be more involved with the education system through stronger advisory roles and the provision of work-based learning opportunities.
6. Students needed to have better information on the requirements for particular occupations, and, indeed, pathways to occupations needed to be made more systematic through improvements in the use of skill standards.
7. The transition from high school to postsecondary education needed to be strengthened, especially for students who had traditionally not continued their education after high school.[1]

Reformers argued that Japan and many European countries had more effective education systems in terms of all of these points with the exception of the last—transitions to postsecondary education.

These principles were operationalized in a series of federal laws. These included the 1990 and 1998 reauthorization of the Perkins Act, the STWOA,

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[1] For a more detailed discussion of the origins of these principles, see Bailey and Smith Morest, 1998.

the Goals 2000: Educate America Act, and the Workforce Investment Act. The STWOA was probably the most comprehensive attempt to implement this broad workforce development strategy.

Developments in the 1990s

While policymakers and educators were trying to restore prosperity by reforming the education system, the U.S. economic system entered a period of unprecedented growth and low unemployment. The number of jobs grew significantly during the 1990s; the unemployment rate fell below 5%; and inflation remained low throughout the decade. Productivity grew faster than in the two previous decades (Moss, 1998; Murnane & Levy, 1996), and in the second quarter of 1999, manufacturing productivity grew at an annual rate of 4.8% (U.S. Department of Labor, 1999). While the acceleration of the import of Japanese automobiles and consumer electronics dominated economic thinking during the 1980s, the international dominance of the U.S. computer and service industries attracted more attention during the 1990s, and the performance of the U.S. stock market was unprecedented.

Certainly, there have been some negative developments. Trade deficits have remained high, and throughout the 1990s, U.S. productivity growth continued to lag behind the rest of the industrialized countries (the members of the Organization of Economic Cooperation and Development [OECD]) (Mishel, Bernstein, & Schmitt, 1999, p. 359). At the end of the 1990s, real wage levels are still well below the levels in the early 1970s, although the decline stopped in the middle of the decade. A variety of macroeconomic factors could threaten the current economic boom, and the inevitable downward part of the business cycle would bring new challenges. Besides, some of the relative improvement in the U.S. economy resulted from serious problems abroad and exogenous factors such as the integration of East and West Germany.

Nevertheless, the relative position of the U.S. is much stronger than most analysts and policymakers would have predicted during the 1980s. Much of the anxiety that the U.S. experienced during the 1980s had to do with manufacturing competitiveness; therefore, the strength of U.S. manufacturing productivity growth is particularly significant.

Can improvements in the education system account for this apparent turnaround? This is unlikely. To begin with, although reformers have made some progress in implementing the workforce development strategy outlined previously, these reforms remain at the margins of the U.S. education system (Bailey & Smith Morest, 1998). Levin (1998) points out that

> no economists have attributed the formidable performance of the U.S. economy since 1992 to successful educational reforms in response to *A Nation at Risk*. The reforms had only modest results to this point, and only a tiny portion of the labor force could have

possibly benefited from these reforms before entering the labor market of the early 1990s (probably 5% or less). (p. 5)

Moreover, there have been moderate, if any, improvements in the test scores of U.S. high school students. The National Assessment of Educational Progress (U.S. Department of Education, 1998b) reported that the trends in science (1969-1996) and mathematics (1973-1996) for 17-year-olds, despite the recent gains, were negative. Declining performance during the 1970s and early 1980s was followed by a period of moderate gains; however, the 1996 average score in science among 12th graders remained lower than the 1969 average, and the average score in math was not significantly different from that of 1973. The average score in reading was not significantly different from that of 1971; the increase in performance from 1971 to 1988 was not sustained into the 1990s. In writing, an overall pattern of declining performance was evident across the assessment years. The average score attained by the students was lower than that in 1984.

The Third International Mathematics and Science Study (TIMSS), the largest, most comprehensive comparison of education, showed that U.S. 12th graders performed below the international average and scored among the lowest of the 21 TIMSS countries on the assessment of mathematics and science general knowledge. Out of 16 countries that administered the physics and advanced mathematics assessments, no country performed more poorly than the U.S. (U.S. Department of Education, 1998a).

Thus, education reform cannot claim credit for positive U.S. economic performance in the 1990s. Furthermore, the current conditions are even more difficult to explain since the U.S. continues to dominate in technology-intensive sectors while math and science skills and knowledge of American students apparently lag behind those of most European and Asian students.

Even so, calls for education reform were not only based on the comparative performance of the U.S. economy. During the 1980s, researchers also marshaled evidence from the U.S. that skill needs were changing. Analysts used three types of evidence in this discussion: (1) relative wage changes, (2) shifts in the occupational distribution, and (3) case studies of work. Have developments in the 1990s reinforced or contradicted the conclusions of the previous decade?

Changes in Wages

The dramatic increase in the differential between the wages of high school and college graduates that took place during the 1980s was one of the bulwarks of the increasing-skill-requirements argument. In 1993, labor economist Kevin Murphy stated,

> The past two decades have been witness to large fluctuations in the price of college labor. Between 1968 and 1978, the price of college labor relative to high-school labor, as measured by the overall college wage premium, decreased by 8%. In contrast, the price of college labor increased by 14% from 1978 to 1988, leaving the relative price of college labor 6% higher in the late 1980s than it was in the late 1960s. Over this same period, the fraction of labor input accounted for by college graduate labor increased from 26.7% in 1968 to 43.6% in 1988. This change represents a phenomenal 14% increase in the ratio of college to high school labor. The fact that relative price of college labor increased during a period when its relative supply effectively doubled implies that there has been enormous growth in the demand for college graduates that has somehow outpaced the rapid growth in supply. (Murphy & Welch, 1993, p. 120)

Not only did the wage premium for a college degree grow during the 1980s, but this increase in inequality was accompanied by a sharp drop in real wages, especially for men. The median real wage for males dropped by about 15% between 1980 and 1994 (Mishel et al., 1999, p. 133).

The growth of the college premium and the drop in real wages both leveled off during the 1990s. The college premium has actually declined slightly for men since 1993, and it has been stable for women since 1995, although this shift is still too recent to conclude that the decade-long increase in the premium has come to an end (Mishel et al., 1999, p. 159). Real wages for both men and women have been more or less stable since 1994 (p. 133). Nevertheless, although the growth of inequality and drop in real wages for most Americans has ceased in recent years, the levels of both of these variables have not returned to their 1980 values. Thus, skilled workers still command a significant earnings premium. This suggests that while the relative labor market value of skills is no longer rising, it remains very high. Moreover, taking into account the continuing increase in the supply of college educated workers in the 1990s (Atkinson & Court, 1998), the stability in the college/high school wage differential could also suggest that the demand for skilled workers continues to increase relative to the demand for less skilled workers, otherwise the college/high school wage differential would have fallen.

Shifting Occupational Structure

Occupational projections have also played an important role in the discussion of the changing skill requirements. The influential 1987 publication, *Workforce 2000* (Johnston & Packer, 1987), emphasizes that those occupations projected to grow the fastest tended to have incumbents with

relatively high levels of education. Skeptics pointed out, however, that many of the occupations projected to add the most jobs were service jobs that did not require much education. This controversy was reviewed by Bailey (1991) who concluded that the data showed a steady, although not dramatic, shift towards occupations with more highly educated workers. He pointed out, though, that the methodology used in the projections tended to minimize the magnitude of any change.

More recent projections also suggest that employment in occupations requiring an associate degree or higher will grow faster than those with less educational requirements (Bowman, 1997). Table 1 is based on data compiled on the growth of nine occupational categories, which have been divided into two groups based on average educational level. The first group of occupational categories has average educational levels, measured by the share of the workers in the occupation with at least some college, above the average educational level for the economy as a whole. Since 1986, these higher-level occupations have grown at more than twice the rate of the lower-skilled jobs, and although they still accounted for less than 40% of employment in 1996, more than half of all net employment growth between 1986 and 1996 took place in the higher-skill occupations. This trend has been continuing since the mid-1970s (Berryman & Bailey, 1992).

Table 1. Changes in the Occupational Structure

Occupations	Number of Jobs in 1996	Percent Distribution	Percent[1] Growth 1986-1996	Percent[2] of Job Growth 1986-1996
Group 1[3]	50,966	38.5	29.4	55.2
Group 2[4]	81,387	61.5	13.0	44.8
Total	132,353	100.0	18.8	100.0

[1] Percent growth for each occupational group
[2] Percent of the nation's total job growth by each occupational group
[3] Group 1 includes executive, administrative, and managerial; professional specialty; technicians and related support; and marketing and sales.
[4] Group 2 includes administrative support; service; agriculture, forestry, and fishing; precision production and craft; and operators, fabricators, and laborers.
Source: Silvestri, 1997

These trends are likely to continue in the future. As a result of the different rates of growth among the major occupational groups, the structure of the total employment will change by the year 2006. Executive, administrative, and managerial occupations; professional specialty occupations; technicians and related support occupations; marketing and sales occupations; and service occupations will increase their share of total employment as they did in the previous ten-year period, 1986-1996. On the other hand, administrative support occupations; agriculture, forestry, fishing and related

occupations; precision production, craft, and repair occupations; and operators, fabricators, and laborers are all expected to decline as a proportion of total employment, as they did in the 1986-1996 period (Silvestri, 1997).

Three out of the ten fastest growing occupations (database administrators, computer support specialists, and other computer scientists; computer engineers; and systems analysts) are found in the rapidly growing computer and data processing services industry, which is expected to more than double its employment size to 2.5 million workers by 2006. These occupations experienced a fast rate of growth, and large numerical increases in employment were experienced from 1986 to 1996 as well. Another of the ten fastest growing occupations—desktop publishing specialists—is also expected to benefit from the proliferation of computers in the workplace. The remaining occupations of the ten are health services-related.

Table 2. Projected Changes in Occupational Structure

Occupations	Number of Jobs in 2006	Percent Distribution	Percent[1] Growth 1996-2006	Percent[2] of Job Growth 1996-2006
Group 1[3]	61,319	40.6	20.3	55.7
Group 2[4]	89,608	59.3	10.1	44.3
Total	150,927	100.0	14.0	100.0

[1] Percent growth for each occupational group
[2] Percent of the nation's total job growth by each occupational group
[3] Group 1 includes executive, administrative, and managerial; professional specialty; technicians and related support; marketing and sales.
[4] Group 2 includes administrative support; service; agriculture, forestry, and fishing; Precision production and craft; and operators, fabricators, and laborers.
Source: Silvestri, 1997

The current occupational outlook and projections for the future suggest that the new jobs that are expected to be created over the next decade will require higher educational levels than current jobs. Today, an estimated 200,000-400,000 high technology-related jobs are vacant in the U.S. The U.S. Department of Labor estimates that during the next ten years, 1.3 million new high-tech jobs will become available, and the national education and training systems are preparing only a fraction of the workers needed to fill those jobs (D'Amico, 1998).

Thus, the occupational data show a continuation of the trends identified in the 1980s. The occupational distribution is steadily shifting towards those occupations that are currently filled with more highly educated workers; however, as Berryman and Bailey (1992) have noted, "although the occupational projections give a more concrete understanding of trends in the nature of jobs, they also have serious weaknesses. In particular, they cannot take into account any changes within occupations" (p. 38). During

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the 1980s, researchers turned to case studies of work to try to identify the nature of within-occupation changes.

Case Studies

Case studies carried out during the 1980s had an important influence on perceptions of changing skill requirements. This research did tend to show an increase in the need for workers to have academic and conceptual skills at lower levels of the occupational hierarchy.[2] SCANS particularly relied on information from case studies to develop its list of necessary skills. Research has also found, however, that the skill requirements depended on the way that employers chose to organize their work processes. It was still possible to organize work in such a way as to minimize skill requirements; therefore, firms could choose a "low road," characterized by low skills and low wages, or a "high road," based on skilled workers and the high-performance work organization. This was the "choice" referred to in the title of *America's Choice: High Skills or Low Wages!* By the early 1990s, a significant minority of large firms with at least 50 workers were implementing some elements of the high-performance work organization (Osterman, 1994).

In the 1990s, case studies have continued to find mixed results. Although many service-producing firms introduced some versions of the high-performance work organization, they did not have a strong influence on skills (Bailey & Bernhardt, 1997). Work by Murnane and Levy (1996) has confirmed the growing need for academic skills (at least at levels higher than those held by a typical high school graduate); the importance of "soft" skills such as problem solving, teamwork, and the ability to make presentations; and the need to use computers to carry out simple tasks like word-processing. Stasz and Brewer (1999) showed the importance of academic skills for sub-baccalaureate technical jobs, but they also indicated that the nature of those skills depended significantly on the particular context in which they were used. Research has also shown a steady increase in the introduction of the high-performance work organization (Appelbaum, Bailey, Berg, & Kalleberg, forthcoming; Capelli, 1999).

Skill-Biased Technological Change

During the 1990s, labor economists in particular have developed a stream of research to try to identify the types of skills that account for the increasing economic returns to more highly educated workers. In general, these analysts have argued that workers working with new microelectronic technologies require higher skills—the new technology is "skill-biased."

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[2] See Bailey (1989) for a review of this literature.

Murphy and Welch's (1993) findings suggest that the within-industry growth in the demand for college labor is pervasive. Growth in the demand for college graduates in the high-skilled areas of manufacturing and, most of all, in professional and financial services has been the most important source of recent demand changes. They also found that changes in the industrial composition of employment have not represented an important component of the growth in the demand for college labor over the past decade (p. 103). Thus, forecasting techniques based on changes in industrial and occupational composition (as the BLS forecasts are) and that neglect occupational and industrial changes will underestimate the extent of change.

The shift in demand toward higher skilled workers involves changes in the workplace due to technological innovation. Two surveys of U.S. manufacturers (Bureau of Census, 1983, 1993) show an increased use of advanced technologies in manufacturing operations. The 1993 survey found that 75% of the companies used at least one form of advanced technology, and 19% reported use of at least five technologies:

> The production function, or the way work is done, has changed. It makes higher skilled workers relatively more productive; for example, the introduction of personal computers as a productivity tool may have shifted the demand for more skilled workers. A shift in the way that work is done has also caused changes in the way workplaces are organized. As work becomes more decentralized, changes in technology give some workers more control over what they are doing, and this alters the production function, or relative demand for higher skilled workers. (Krueger, 1993, p. 35)

On the other hand, less skilled workers have suffered declines in relative wages. Labor economists generally believe that skill-biased technological change is the principal culprit for the increasing wage gap between skilled and unskilled workers.

Bresnahan, Brynjolfsson, and Hitt (1999) summarized the results of various studies conducted by labor economists:

> The important results from these studies are that the relative demand for more highly educated workers is rising (*probably* related to general cognitive skill), that the relative demand for more experienced workers is rising (*likely* specific knowledge or managerial/people skills), and that the relative demand for "residual" highly skilled workers (skills not captured by education and experience) is rising as well. (p. 3)

They observed considerable support for the view that relative demand is shifting toward cognitive and interpersonal skills.

Berman, Bound, and Machin (1997) presented evidence based on the data from the OECD countries that the kind of skill-biased technological change, which occurred in the U.S., has been pervasive across the OECD:

> Substitution toward skilled labor within industries occurred in all ten developed countries that we studied in the 1970-90 period, despite constant and increasing relative wages of skilled labor. The industries with common large within-industry contribution to skill upgrading are machinery (& computers), electrical machinery, and printing and publishing. Together, these three account for 40% of the within-industry increase in the relative demand for skills. Case studies reveal that all three of these industries underwent significant technological changes associated largely with the assimilation of microprocessors. (p. 19)

The employers and human resource managers that participated in case study research of selected industries and companies expressed the need for their workers to have higher skills in general as well as for specific academic skills. Rosenbaum and Binder (1997) found that the majority of employers do have clear needs for specific academic skills, that these needs occur under relevant job conditions, and that employers engage in costly actions to get those skills (pp. 69-70).

Holzer (1996) found that basic academic skills such as reading, writing, and mathematics are required daily in the vast majority of jobs for noncollege graduates:

> Overall, only 5-10% of the jobs in central-city areas for non-college graduates require very few cognitive skills or work credentials. In these same areas, it appears that a much larger percentage of residents lack at least one or more of the credentials required by employers. (p. 70)

Reassessing the Workforce Development Reform Agenda

Thus, the 1980s' conception of workplace skill needs that formed the basis of the current workforce development reform agenda was for the most part confirmed by research during the 1990s. College graduates still receive a substantial premium in the labor market; jobs are shifting steadily towards occupations with more highly educated incumbents; and there is some evidence that academic and SCANS skills are increasingly important. This suggests that a policy based on that perception of workplace

developments is probably still appropriate, despite the changes in the strength of the U.S. economy relative to its competitors.

Nevertheless, it is important to emphasize that when researchers try to identify the particular skills that are important for success at work, the conclusions are far from definitive. While the case study evidence is suggestive, it cannot identify specific required skills with any precision, and the quantitative studies tend to include words like "probably" and "likely" in their conclusions about specific required skills. As Levin (1998) points out, the measured relationships between traditional test scores and workplace performance are usually modest at most. He argues that there is no doubt that education, more generally, is an important determinant of earnings, and that while economists have found that the returns to investment in human capital are substantial, specific educational outcomes that could explain workplace productivity have not been identified (p. 5).

Although the 1980s' perceptions about the nature of work were more or less accurate, the prediction that the U.S. would not be able to compete with Japan and much of Europe unless it made significant changes to its education system was not. In retrospect, this should not have been surprising. Even the alarmist publications such as *A Nation at Risk* and *America's Choice: High Skills or Low Wages!* never presented any concrete or systematic evidence that educational factors caused the economic problems experienced by the country in the 1970s and 1980s, and changes in a country's education system should take many years to have a significant influence on the overall economy as those students work their way through their education and into the workplace.

On the one hand, the argument that the U.S. economy was crippled by its inept education system was wrong may not be relevant. Alarmist arguments served an important purpose in generating interest in education reform even if those arguments were too pessimistic. On the other hand, the perception that the Germans or the Japanese did a better job of preparing their workforce did influence the nature of the education reforms introduced in the 1990s. Would a more skeptical view about the strengths of the Asian and European education systems alter the direction or content of the U.S. workforce development strategy that has emerged over the last decade? In the next section, we review the seven principles of workforce development previously outlined and ask whether our judgments and expectations about those policies should be influenced by the changing relative economic performance of the U.S. and its competitors or by the recent research on the nature of work and skill requirements.

The first principle emphasized the rising importance of academic skills. If there is any consensus about education in the U.S., it is that all students need a solid foundation in academic skills. This is probably based more on core cultural values than on any argument that these skills are needed for work. Throughout the country, states are taking steps to strengthen

academic skills, primarily through more rigorous testing. Greater skepticism about foreign education systems will not influence this trend. Indeed, the U.S. emphasis on college preparation, which primarily involves academic courses, probably looks better now than it did when educators were trying to pursue the European model.

A comparative perspective on academic skills does suggest that we still lack a good understanding of which academic skills are important for work. The comparative test score results indicate that American schools do a relatively poor job of preparing their students for formal tests of academic skills. Some of the initial reactions to the TIMSS results raised concerns about the country's future ability to compete internationally. Soon, however, other commentators began to question whether the skills measured by these tests were in fact vital for the economic strength of the country. Still others have claimed that it is the very flexibility and lack of structure criticized by many reformers that accounts for the apparent anomaly. This is illustrated by the headline in a March 2, 1998, *New York Times* article, "Freedom in Math Class May Outweigh Tests" (Bronner, 1998). Experts quoted in the article assert that the quality and accessibility of postsecondary education in the U.S. may actually compensate for the inadequacies of secondary schools. It also may be that academic skills are crucial but that TIMSS did not measure the right ones or did not measure them correctly.[3] In any case, all of this simply indicates the level of our ignorance about the relationship between specific academic skills and economic performance.

The second principle emphasized the teaching of SCANS skills—competencies that are neither academic nor specifically vocational. This recommendation did not flow in any direct way from foreign models, so changing views about those models are not likely to have much influence. The critical questions about these skills have to do with measuring them and teaching them, and educators in all countries are struggling with these issues.

The third principle called for a shift from process to outcome regulation. During the 1980s, reformers pointed out that some other countries made more use of national tests; however, the outcome-versus-process-regulation controversy in this country did not arise primarily from foreign examples. As skepticism and cynicism about the public sector has grown, policymakers at all levels of government have looked for concrete measures of effectiveness. The trend towards accountability and an emphasis on outcome measurement is probably independent of views about foreign education systems.

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[3]Some critics argue that the relatively poor performance of U.S. high school students is context-dependent; that is, TIMSS are very low-stakes tests with no individual consequences for American students as compared to their international counterparts.

According to the fourth and fifth principles, educators needed to make more use of innovative pedagogies, such as the integration of academic and vocational education and work-based learning, and they needed to involve employers more intensively in the education system. Although all of these reforms have a long history in the U.S., they began to receive much more emphasis during the 1980s and early 1990s, and this can probably be attributed to the influence of foreign experience. The mixing of practical applications and academic learning and the involvement of employers is particularly important in Germany and other countries with large apprenticeship systems. It is fair to say that as policymakers have become more aware of the economic problems faced by these countries, they have put less emphasis on work-based learning and employer involvement in education. Indeed, parents and students in Europe have moved away from the apprenticeship system, preferring to attend secondary schools that will give them access to a university education.

There are, however, other sources of inspiration for these innovative pedagogies. The situated and contextual learning perspectives continue to be influential, and they provide theoretical support for the integration of academic and vocational education and work-based learning. These perspectives address the mismatch between typical school and "real world" situations such as the workplace (Anderson, Reder, & Simon, 1996). One of the main premises is that learning best occurs in a rich social context in which learners are engaged in meaningful "real world" activities (e.g., Collins, Brown, & Newman, 1989; Greeno, Smith, & Moore, 1992; Lave & Wenger, 1991; Resnick, 1987). Thus, to effectively prepare students for the workplace, educational institutions must provide experiences which bridge the theoretical learning of the classroom and the actual practice of the work environment; however, there is still little concrete, empirical support for the effectiveness of these pedagogies for secondary school students. (Integrated pedagogies are widely accepted in the U.S. for professional education.) As the foreign examples have become less influential, advocates of these innovations will have to develop more definitive evidence that they can be effective.

The sixth principle called for better information on the requirements for particular occupations. It suggested that pathways to occupations needed to be made more systematic through improvements in the use of skill standards. Young people in many European countries often have a much clearer idea than Americans about what they need to do to prepare for particular occupations, and the European examples were used to advocate a clearer statement of occupational pathways and skill requirements. Comparative arguments probably had a strong influence on the establishment of the National Skill Standards Board, for example. Thus, changing views about the effectiveness of European systems have probably weakened support for skill standards. On the other hand, the growing

attention to standards and accountability may have counteracted that influence.

Developing specific skill standards and clarifying occupational pathways is particularly difficult in the flexible and diverse labor market. Setting out narrow, compartmentalized skills by dividing jobs into a list of discrete tasks or skills and taking inventory of mastered tasks strips workers of autonomy and obstructs innovation. According to Bailey and Merritt (1997), "To the extent that [the] skill standards movement encourages the development of simple, one-shot assessments, it will stand in the way of broader education reform" (p. 431). They further state that in the best case scenario, industry skill standards will enable workers to perform more complex general functions such as problem solving, reasoning, and exercising judgment; however, the potential contribution of the skill standards movement to broader education reform is not yet clear.

Two problems thwart the development of a clear sense of what young people must do to enter a particular occupation. First, informal networks and contacts are of paramount importance in the U.S. labor market. Institutionalizing these networks, especially under the auspices of the public sector, is extremely difficult, and attempts to do so have generally been confined to lower levels of the employment hierarchy. Second, transparency requires more than information; it also depends on stronger regulation of the labor market. If anything, political trends are leading in the opposite direction—towards less regulation. Other countries, such as Germany, that have a more understandable system of career development, also have considerably more government regulation and intervention in the labor market. Career progression is most transparent when there are legal restrictions and related educational regulations for practicing particular professions. If a young person wants to become a doctor or a lawyer, the required educational steps are easy to explain, although many young people may not know them. This is a problem that can be solved with better information. How to become a software developer or to own a business is much less obvious because there are so many possible routes to these occupations.

The final principle suggested that the transition from high school to postsecondary education needed to be strengthened, especially for students who had traditionally not continued their education after high school. This view owes little to international examples. Indeed, the U.S. education system has put more emphasis on college than most of its competitors, so a weakening of the influence of the international models will probably strengthen support for the college emphasis.

Conclusion

Much of the workforce development reform agenda that was developed in the 1980s and early 1990s remains intact. Greater skepticism about the European and Asian systems has probably reinforced an emphasis on academic skills and college attendance. The research during the 1990s on the nature of work and skill requirements also provides support for reforms emphasizing academic skills and the transition to college. The research has also produced some evidence of the importance of SCANS skills, and arguments based on international comparisons have not had much influence. The emphasis on outcome regulation and accountability is driven by a logic of its own and does not seem to be influenced either by research or by international comparisons. The changing international comparisons have had the most negative influence on those aspects of the reform agenda that were most closely tied to employers and the workplace—employer participation, work-based learning, and systems of specifically focused skill standards. The loss of influence of the international comparisons has weakened support for these policies, and there is little systematic evidence of their educational effectiveness (although there are many encouraging examples). The comparative policy discussion created a counterweight to the traditional school and college-focused secondary education system in this country. As the comparative arguments lose force, we will probably see a further strengthening of that school and college focus but with an additional emphasis on testing of academic skills. SCANS skills could play a role if educators could figure out how to measure and assess them. The effect of all this is that traditional high school vocational education will continue to fade.

What is perhaps most surprising is how little we know about the relationship between education and economic performance after twenty years of education reform explicitly designed to improve that performance. Evidence suggests that more education improves national economic growth and productivity and increases individual earnings (which has some relationship to individual productivity). We know much less, however, about exactly which skills are most important and how they should be taught. Education reformers have made productive use of international comparisons for generating ideas about alternative policies and strategies; however, it is often misleading to try to draw firm conclusions about the effectiveness of policies through comparisons, especially when only a handful of countries are being compared. Many factors other than education influence macroeconomic performance and, in any case, any educational policy could only be expected to have an effect after many years. Educators should continue to travel to other countries to observe how things are done abroad, but, at this point, we need to focus at a more microeconomic level,

at specific workplaces and classrooms, and at the determinants of individual career progression if we want a more concrete and specific understanding of the education and skill needs of the economy.

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